

ERGONOMIC CHAIR DESIGN TO FACILITATE RUKU' AND SUJUD: ENHANCING PRAYER ACCESSIBILITY FOR DISABLED WORSHIPPERS AT MASJID SIBU

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ABSTRACT

This research examines the ergonomic challenges faced by individuals with disabilities in performing basic prayer movements such as Ruku' and Sujud in the context of the Sibu Mosque. Acknowledging the shortcomings of existing chair designs in facilitating this movement, this study uses a multifaceted approach to understand the specific needs and preferences of disabled worshippers. Through a combination of interviews, surveys and ergonomic assessments, researchers carefully identified key design considerations to improve accessibility and comfort during this important prayer movement. Subsequently, the researcher carefully developed and evaluated a prototype chair design that incorporates these identified considerations, with the ultimate goal of empowering individuals with disabilities to perform Ruku' and Sujud more easily and with dignity. The results of the research can significantly contribute to the development of an inclusive mosque environment that supports the spiritual well-being and full participation of all congregations, regardless of physical ability.

Keyword: Ergonomic, Accessibility, Prayer Movements, Chair Design, Physical Ability.

INTRODUCTION

Islam strongly emphasizes the obligatory five-time prayer in congregation, especially in the mosque environment. However, Muslim worshippers with physical disabilities often face challenges in performing the essential postures of prayer, specifically the ruku' (bowing) and sujud (prostration) positions. This research paper aims to propose an ergonomic chair design that caters to the unique needs of these individuals, enabling them to participate in congregational prayers with ease and dignity. This oversight can inadvertently exclude disabled worshippers from fully engaging in the communal act of prayer, undermining the inclusive nature of the masjid. To address this concern, the proposed ergonomic chair design incorporates features that accommodate the specific needs of worshippers with disabilities, ensuring their comfort and active participation during the ritual movements of prayer.

PROBLEM STATEMENT

Traditional mosque design often overlooks the accessibility requirements of disabled individuals, inadvertently excluding them from full participation in prayers. Existing chair designs frequently lack adequate support and flexibility for comfortable Ruku' and Sujud, causing pain and hindering worship. The absence of standardized ergonomic guidelines for prayer chairs further exacerbates this issue.

AIM

The aim of this research is to design and evaluate ergonomic chairs that enable disabled individuals to perform Ruku' and Sujud with ease and comfort, thereby enhancing their participation in religious activities at Masjid Sibul.

RESEARCH OBJECTIVE

- To identify existing specific chair design problems experienced by the disabled.
- To develop and evaluate ergonomic chair designs that facilitate Ruku' and Sujud for disabled worshippers, thereby improving their participation in religious activities at Masjid Sibul.

RESEARCH QUESTION

- What is/are specific chair that could potentially used for people with special abilities during ruku' and sujud when performing salat?
- How can chair designs be optimized to enhance the accessibility and comfort of Ruku' and Sujud for disabled individuals at Masjid Sibul?

SIGNIFICANCE OF STUDY

This research has several important implications first, improved accessibility: By addressing the ergonomic challenges faced by individuals with disabilities, this research will contribute to creating a more inclusive and welcoming environment in the Sibul Mosque. Second, enhanced participation: The development of appropriate prayer aids will enable individuals with disabilities to participate more fully in religious ceremonies, fostering a sense of belonging and spiritual well-being. Third, informative guidelines: Research findings will provide valuable insight into design requirements for prayer chairs, inform future developments and promote accessibility in other religious institutions. Fourth, community impact: This study will have a positive impact on the wider community by promoting inclusion and understanding of the needs of individuals with disabilities.

LITERATURE REVIEW

MOSQUE IN ASIA

The role of mosques (Masjid) in Asia goes beyond mere places of worship; they serve as important community centres, cultural landmarks, and agents of social change. The importance of these various aspects is evident across various Asian contexts. Looking at the importance of mosque architecture in Asia exhibits a combination of local styles and Islamic traditions significantly such as the Taipei Grand Mosque, which integrates Umayyad and Ottoman elements, reflecting Taiwan's unique cultural landscape (Broilo, 2019). Similarly, South Asian colonial mosques illustrate the evolution of Islamic architecture under colonial influence (Kazimi, 2022). In addition, the mosque became a place which plays an important role in disaster management, acting as an information centre and evacuation site, further increasing community resilience (Mohit, 2014). Their influence extends to urban revitalization, as seen in Seoul, where mosques have changed neighbourhood dynamics since their inception (Drews, 2022). In some regions, mosques are built as monumental structures that emphasize their role in shaping the religious landscape and cultural identity throughout Asia (Koch et al., 2018). While mosques are primarily seen as religious spaces, their broader social, cultural, and architectural impacts highlight their importance in Asian societies.

MOSQUE IN MALAYSIA

Looking at the role of mosques in Malaysia which goes beyond a mere place of worship; it serves as an important community center, an economic support system and a model for sustainable architecture. The importance of these various

aspects highlights the growing function of the mosque in contemporary Malaysian society. Among the factors obtained is Economic Empowerment. Mosques in Malaysia actively contribute to the local economy through mechanisms such as zakat and waqf. These institutions provide financial assistance and resources to improve the economic status of the Muslim community, showing their important role in economic welfare (Wakil et al., 2024). In addition, Social and Educational Functions historically speaking. Mosques in Malaysia have become centres of social and educational activities, echoing their importance in the time of the Prophet Muhammad. They continue to serve as hubs for community engagement and knowledge dissemination, adapting to modern needs while maintaining their fundamental role (Shahbuddin & Gunardi, 2023). Next, Architectural Sustainability. Recent studies emphasize the need for sustainable design in mosques, supporting green architecture to reduce carbon footprints. The Raja Fi Sabilillah Mosque exemplifies this approach, using passive cooling and renewable energy to improve environmental sustainability (Ismail & Rashid, 2023). Additionally, vernacular design principles are being integrated into modern mosque architecture to improve thermal performance (Nawayai et al., 2023). On the other hand, some argue that the focus on modernization may overshadow traditional practices and community involvement that have the potential to dilute the mosque's original purpose as a centre of spiritual and community life.

MASJID AN-NUR, SIBU

An-Nur Mosque in Sibul, Sarawak serves as an important religious and community hub with efforts to increase its reach and function. Recent studies highlight various aspects of community engagement architecture and its technology integration. Community involvement in this mosque has a capacity of 200 people, but attendance during normal prayers is low with an average of around 20 people present ("Implementation of Google Sites as a means of digital marketing of mosque an-nur", 2023). Therefore, a digital marketing initiative using the Google Site was implemented and has resulted in an increase of 24 visitors in one day after the launch, showing a positive response to the online reach ("Implementation of the Google Site as a means of digital marketing of Masjid an-nur", 2023). Therefore, the involvement of the youth in the mosque plays an important role in approaching the community, organizing activities that not only involve young members but also attract the participation of the wider community (Arlina et al., 2023).

MOSQUE FACILITIES

The design of prayer facilities in mosques often ignores the needs of individuals with physical limitations leading to significant accessibility challenges. Research shows that many mosques lack important features such as ramps, accessible toilets, and designated prayer areas for people with disabilities (PWD) (Suhardi et al., 2024)(Yahya et al., 2024). A comprehensive study of Malaysian mosques emphasizes that entrance facilities are particularly problematic with 47 articles emphasizing its inadequacy (Yahya et al., 2024). Furthermore, studies suggest that inclusive mosques should include physical, social and management dimensions to effectively accommodate the disabled (Hanun et al., 2023). Capacity building for mosque administrators is important because many lack the knowledge and resources to improve accessibility (Anama et al., 2023). Finally, a case study in Lombok revealed that most mosques do not provide the necessary facilities such as wheelchair access and sign interpreters thereby marginalizing individuals with disabilities (Naamy, 2023). Despite these challenges, there is growing awareness and support for inclusive design in mosque architecture, which could lead to significant improvements in accessibility for the disabled in the future.

SALAT AND MOVEMENT

Prayer is one of the pillars of Islam that Muslims do five times a day. This is because it was ordered by Allah SWT to be done for every Muslim who has reached the end of puberty (P. Mani, et al, 2021). Prayer is a practice that is obligatory for all Muslims who meet the conditions. In addition to being an obligatory act of worship, prayer can also benefit mental and physical health and can provide peace of mind (R. Fauzi, 2008). Various diseases such as weak heart, high blood pressure, joint pain, bone pain, eye pain and so on can be avoided by every muscle movement of the body in daily prayer (R. Fauzi, 2008). Another opinion states that there is a positive relationship between the material movement system in humans and the movement of prayer when takbiratul ihram, bowing, prostrating, sitting between two prostrations and salam (M. Nasrudin (2021). Focusing on movement in prayer has been studied for its various health benefits across different demographics. There is some research showing that this movement can have a significant impact on physical

health, flexibility and mental well-being. According to Irianto, among the important points that are affected by the prayer movement on physical health are from a combination of spine and prayer. A study on adolescents with idiopathic scoliosis showed that spinal fusion surgery had a positive effect on their ability to pray with 36.4% reporting an improvement in the quality of prayer after surgery (Irianto et al., 2024). The next point is joint mobility in the elderly where a study that emphasizes that frequent performance of Salah improves joint mobility and balance in elderly individuals (Putri & Nurviyandari, 2018). The next point is mental well-being and anxiety reduction. Carrying out prenatal exercises that incorporate prayer movements was found to be effective in reducing anxiety levels and normalizing blood pressure in pregnant women, demonstrating the mental health benefits of prayer movements (Meiranny et al., 2022). Other research has also shown that Islamic prayer movements function as effective stretching exercises that significantly improve lower back flexibility in students compared to their peers who do not perform such movements (Jannati, 2021). Although the benefits of prayer movements are well documented, several studies suggest that physical limitations after surgery may still pose a challenge for certain individuals, indicating the need for an adapted rehabilitation approach (Irianto et al., 2024).

SALAT POSTURE

The posture during Salat, the Islamic prayer, involves specific movements that have physiological implications and can be monitored for correctness. Research indicates that performing Salat significantly activates pelvic floor muscles, although contraction intensity is lower than maximal voluntary contractions (Ibrahim et al., 2024). Additionally, the positions assumed during Salat can influence intra-ocular pressure, with notable changes observed immediately after prayer (Aldossary et al., 2023) (Cogliano, 2023). From the point of view of physiological effects Pelvic floor muscle activation shows that significant activation during Salat movement shows potential benefits for pelvic health (Ibrahim et al., 2024). The pelvic floor muscles work to support the bladder, intestines and uterus. It also prevents incontinence of the bladder, intestines, and prolapse and is also important in sexual function (Pelvic Floor, 2021). In addition from the point of view of Intra-Ocular pressure, change shows a temporary increase in intra-ocular pressure immediately after Prayer which requires further investigation (Aldossary et al., 2023)(Cogliano, 2023). According to Rahman, there should be a Monitoring and Training System or Smart Monitoring System where an advanced system that uses image processing can help the congregation ensure the correct posture during Prayer to deal with common mistakes made by novices (Rahman et al., 2023) (Rahman et al., 2021). Although the physiological benefits of the Salat posture are clear, the need for a proper training and monitoring system highlights the importance of proper practice to maximize these benefits.

RUKU' (BOWING) AND SUJUD (PROSTRATION)

The concept of ruku' (bowing) and sujud (prostration) is an important component of Islamic prayer (Salah) with specific practices that have developed over time. Understanding these movements involves examining their historical context and the interpretations that have emerged in different communities. Referring to the historical context, bowing and prostration are performed tauqifi, as taught by the Prophet Muhammad. There is no clear difference in this movement between men and women in the original hadith (Hanif & Yulia, 2024). However, cultural interpretations have led to variations, especially regarding women's practices, where some traditions suggest women should close their limbs during this movement (Hanif & Yulia, 2024). Through the interpretation of society, the understanding of bowing and prostration has changed through various Islamic sects, especially in the tradition of Imam Syafi'i who emphasizes a posture specific to women (Hanif & Yulia, 2024). This transformation reflects broader societal norms and the evolution of religious practice, showing that although the basic movement remains consistent, and its implementation can vary based on cultural and theological interpretations (Hanif & Yulia, 2024). Although the core principles of bowing and prostration are universally recognized, variations in practice highlight the dynamic nature of Islamic jurisprudence and the influence of cultural context on religious observance.

CHAIR FOR SUPPORT DISABILITY TO PERFORM SALAT AND ERGONOMIC

The Salat chair is designed to facilitate the performance of the Islamic prayer (Salat), particularly for individuals with mobility challenges, such as the disabled, elderly or those recovering from surgery. Research highlights the importance of ergonomic features in these chairs to enhance prayer performance and safety. Ergonomic chair design for the elderly

and disabled making the addition of armrests and seat aids significantly improves the individual's ability to transition from sitting to standing during prayer as well as reducing the time taken for this movement (Ningrum et al., 2020). The study involved 17 elderly participants and showed that this modification could improve their overall prayer experience and physical safety (Ningrum et al., 2020). Considerations for patients with hip movement in certain Prayers such as sujud (prostration) may pose a risk. It is recommended that these individuals pray while sitting to avoid complications (Ismail et al., 2014). The design of prayer chairs can be adapted to accommodate these needs by ensuring patients can perform their religious practices safely (Ismail et al., 2014). According to Osama, the Therapeutic Benefits of Prayer are comparable to light-intensity exercise that involves several muscle groups and improves balance which can be beneficial for recovery (Osama & Malik, 2019) (Khanam et al., 2015). The movements involved in Prayer activate the major muscles indicating that a well-designed chair can support spiritual and physical health (Khanam et al., 2015). At present, such worshippers rely on conventional chairs for assistance in achieving positions of prayer that they cannot assume (Badwin S. Z., et al, 2021). Unfortunately, the use of such conventional chairs causes disturbances to worshipers in the row behind the chairs or/and misaligns their users with prayer rows (Badwin S. Z., et al, 2021). Innovation and production of prayer seats can widely be seen around the world, particularly in a nation or region with a majority Muslim population (Abdullah S. M. F., et al, 2020). Most of the existing devices consist of basic systems and sometimes do not accurately meet disabled Muslim requirements (Abdullah S. M. F., et al, 2020). There is a statistically significant difference ($p < 0.001$) in the history of chair users offering prayers (Mahamed Ateef, et al, 2021). Therefore, the Prayer chair serves as an important tool to improve the prayer experience for individuals with mobility problems while also promoting physical well-being through its ergonomic design. However, it is important to consider the individual's health condition when designing these chairs to ensure safety and accessibility.

DISABILITY

Types of disabled people who often come to the mosque such as deaf, visually impaired, mute, crutches, and wheelchair users (Iksan, et al, 2022). People with disabilities face several difficulties due to the loss or change in the function of their body structure (Badwin S. Z., et al, 2021). For example, disabled people who are deaf find it difficult to hear every reading and movement of the imam during congregational prayer (Winasis, et al, 2022), they are forced to observe the congregation around them to follow the movement of the imam in prayer. For disabled persons who cannot stand, praying in a chair can be a beneficial option for individuals who have not been able to go to the mosque for years (Badwin S. Z., et al, 2021). Accessibility is a form of sympathy and empathy to facilitate the disabled by providing friendly public facilities (Lestari, P., & Raodah, R., 2020). However, the accessibility of facilities is still not fully adequate and disabled-friendly for disabled people who use crutches, crutches and wheelchairs (Lestari, P., & Raodah, R., 2020). The research was carried out by identifying the factors that hinder the disabled when using this facility, and designing this facility to be easy to use by the disabled, especially wheelchair users (Tri Putri, N., Abrar, R., & Fatrias, D., 2022).

METHODOLOGY

This proposal outlines the methodology for a research project aimed at designing accessible prayer chairs for disabled worshipers at the Sibul Mosque. The project will involve a qualitative data collection, ergonomic assessment, and a design and evaluation process to develop an innovative and inclusive prayer chair solution.

DATA COLLECTION

Qualitative Research: the selection of this approach will allow the researcher to deepen the experiences and perspectives of individuals with disabilities regarding the challenges they face in performing prayer movements. Researchers use methods Semi-Structured Interviews and Direct Observation. Semi-structured interviews will be conducted with individuals with disabilities, caregivers, and mosque officials to gather rich and detailed information about their experiences, needs, and preferences. While in terms of observation, the researcher will make direct observations of disabled individuals who perform prayer movements in the mosque will be conducted to identify physical challenges as well as the use of chairs provided in the mosque and potential design solutions.

In addition, for the sampling technique, the researcher chose to use snowball in addition to where this technique will be used to identify and recruit disabled participants who may have difficulty performing prayer movements. Initial participants will be identified through mosque officials, disability organizations, or health care providers. These participants will then be asked to refer other individuals who may be eligible for this study.

The conceptual framework chosen by the researcher is to focus on disabilities where the researcher needs to understand the various types of disabilities that can physically affect the movement of prayer. In addition, using ergonomic design principles to design prayer aids that are comfortable, safe and functional. Next, User Centered Design can look at the involvement of individuals with disabilities in the design process to ensure that their needs and preferences are met.

A pilot study was conducted to test the research instruments, data collection procedures, and analysis methods before the researcher used them at the actual study site. In this way will help the researcher refine the research design and ensure its feasibility.

ERGONOMIC ASSESSMENT

The researcher plans to evaluate the existing chairs where the chairs found in the Sibu Mosque will be evaluated using ergonomic principles, taking into account factors such as range of motion, stability, comfort and posture support during Ruku' and Sujud. The evaluation will identify areas for improvement and inform the design of the prototype.

DESIGN AND PROTOTYPING

In the next process, prototype development based on the insights gathered from the data collection and ergonomic evaluation, an innovative chair prototype will be developed. The prototype will incorporate ergonomic principles and address the specific challenges of Ruku' and Sujud, aiming to provide optimal support and comfort for disabled worshippers.

USER TESTING AND EVALUATION

A rigorous user testing process will be conducted with disabled individuals to evaluate the effectiveness and usability of the prototype chair. Participants will be asked to perform Ruku' and Sujud using the prototype and provide feedback on factors such as ease of use, comfort, stability, and overall satisfaction with the prayer experience. Therefore, data analysis through feedback collected from user tests will be analyzed to identify areas for improvement and inform further design iterations.

This methodology outlines a comprehensive approach to designing accessible prayer chairs for disabled worshippers at Sibu Mosque. By combining qualitative and quantitative data collection, ergonomic evaluation and user testing, the project aims to develop innovative and inclusive solutions that meet the specific needs and preferences of individuals with disabilities.

EXPECTED FINDING

1. Improved Ruku' and Sujud Performance

The research anticipates developing chair designs that significantly enhance the ability of disabled individuals to perform Ruku' and Sujud comfortably and correctly. The prototypes will incorporate features that provide adequate support, stability, and adjustability, enabling users to perform these movements with greater ease and confidence. Improved comfort and stability: The designed prayer chair is expected to provide better comfort and stability for worshippers with disabilities during Ruku' and Sujud, reducing tension and physical discomfort. Enhanced range of motion: Chairs will be designed to accommodate a wider range of motion, allowing individuals with physical limitations to perform Ruku' and Sujud more effectively. Improved postural support: The chair will offer proper postural support to help maintain proper alignment during prayer, reducing the risk of injury or discomfort.

2. Positive User Feedback

The research expects to receive positive user feedback from disabled worshippers, indicating an improved prayer experience, reduced discomfort, and increased feelings of inclusion. The user testing phase will provide valuable insights into the effectiveness and usability of the proposed chair designs. Increased satisfaction with the prayer experience: Users are expected to report a significant improvement in their overall prayer experience, with higher levels of satisfaction and enjoyment. Improved accessibility and inclusivity: The designed chairs will contribute to a more inclusive and accessible prayer environment, empowering worshippers with disabilities to fully participate in religious activities.

3. Design Guidelines and Recommendations

The research will generate design guidelines and recommendations that can be implemented in Masjid Sibul and other mosques. These guidelines will encompass ergonomic principles, accessibility features, and design considerations for inclusive prayer spaces, fostering a welcoming and accessible environment for all. Adaptability and adaptability: The design guidelines will emphasize the importance of adaptability and adaptability to accommodate various physical abilities and preferences. Durability and ease of maintenance: The chair will be designed to be durable and easy to maintain, ensuring its long-term use and functionality. Cost-effectiveness: The design guidelines will consider cost-effectiveness to ensure that chairs are accessible and affordable for mosques and individuals.

By achieving these expected results, the project will contribute to improving the accessibility and inclusivity of prayer spaces for disabled worshippers, promoting a more equitable and welcoming religious environment.

CONCLUSION

This research will contribute valuable knowledge to the field of inclusive design and assistive technologies for religious practices. The study will highlight the importance of considering the specific needs and challenges of disabled individuals in mosque design and will provide evidence-based recommendations for creating more accessible and inclusive prayer spaces. For implication for Mosque Design, the findings of this research will have significant implications for mosque design, promoting the integration of accessibility features and ergonomic considerations into future mosque construction and renovation projects. The study will provide valuable insights for architects, engineers, and mosque administrators to create more inclusive and welcoming spaces for all worshippers. For wider adoption and impact, the proposed chair designs have the potential for wider adoption in mosques and other religious institutions, fostering a more inclusive and welcoming environment for disabled individuals. The study's findings can serve as a model for other communities seeking to enhance accessibility and inclusivity in their religious spaces.

REFERENCES

- AbdullahSolihin Mohd Fauzi, A., Ahmad Abror Hakim Bin Sa'idan, J., Juliza Jamaludin, J., Wan Zakiah Wan Ismail, W., Irneza Ismail, I., Mus'ab Sahrim, M., Bushra Naeem, B., Ahmad Syahmi Mohd Zain, A., Farah Aina Mohd Jamal, F., & Syarfa Najihah Raisin, S. (2020). The Development of Solah Chair Using Electronic Sensor to Assist Disabled Muslims in Performing Prayers. *REKAEL: Jurnal Kajian Teknik Elektro dan Komputer*, 1(1), 25-34. <https://doi.org/10.26760/rekaelkomika.v1i1.25-34>
- Aji, I. W. R., Suhardi, B., & Iftadi, I. (2022). Evaluation and design accessibility of mosque's facilities for people with disabilities. *Journal of Islamic Architecture*.
- Amirul, Fikri, Hanif., Rahmi, Yulia. (2024). Transformasi Pemahaman Hadis Tata Cara Rukuk dan Sujud Bagi Perempuan. *JURNAL RISET RUMPUN AGAMA DAN FILSAFAT*, 3(1):251-264. doi: 10.55606/jurrafi.v3i1.2862
- Arlina, Arlina., Mona, Febrica, Silva., Nurhasanah, Sipahutar., Halim, Palindungan, Harahap., Novia, Fehbrina., Maria, Ulfa, Lubis., Putri, Suci, Ramadhani. (2023). Peran Remaja Masjid Dalam Meningkatkan Dakwah di Masjid An-Nuur Kelurahan Damai Kecamatan Binjai Utara. *Dakwatussifa Journal of Da wah and Communication*, 2(1):41-50. doi: 10.56146/dakwatussifa.v2i1.78

- Arum, Meiranny., Alfiah, Rahmawati., Atika, Zahria, Arisanti. (2022). Is Prenatal Exercise with Prayer Movement Affecting Anxiety Level and Blood Pressure in Third Trimester?. *KEMAS: Jurnal Kesehatan Masyarakat*, 17(3):329341. doi: 10.15294/kemas.v17i3.26552
- Ateef, M., Mushabab Alqahtani, M., Alzhirani, M., & Alshewaier, S. (2021). Physical Function and Quality of Life and Modification of Authentic Islamic Prayer Procedure by Osteoarthritis Knee Patients in Saudi Arabia: A Cross sectional Study. *Journal of Religion and Health*, 60(4), 764-773. <https://link.springer.com/article/10.1007/s10943-019-00878-8>
- Azmi, N. A., Arıcı, M., & Baharun, A. (2021). A review on the factors influencing energy efficiency of mosque buildings. *Journal of Cleaner Production*, 292, 126010. <https://www.sciencedirect.com/science/article/abs/pii/S0959652621002304>
- Bambang, Suhardi., Muhammad, Fawaid, Nurazizi., Irwan, Iftadi. (2024). Improved Accessibility for People With Disabilities at the Sheikh Zayed Grand Mosque Using a Universal Design Approach. *Journal of Islamic Architecture*, 8(1):269-282. doi: 10.18860/jia.v8i1.23412
- Fareha, Abdul, Rahman. (2011). Mathematical model of speech intelligibility in mosque with column pillars (model matematik kejelasan percakapan di dalam masjid yang bertiang).
- Fareha, Abdul, Rahman., Mohamad, Ngasri, Dimon., Mokhtar, Harun., Siti, Zaleha, Badul, Hamid., Ahmad, Hafiz, Husin. (2010). Mathematical model of speech intelligibility in mosque with column pillars.
- Farzana, Khanam., Shadli, Islam., Md., Asadur, Rahman., Mohiuddin, Ahmad. (2015). Muscle activity estimation through surface EMG analysis during salat. 1-6. doi: 10.1109/ICEEICT.2015.7307402
- Fatimah, Ibrahim., Wen, Wang., Fauzani, N., Jamaluddin., Azad, Hassan, Abdul, Razack. (2024). Physiological Changes in Male Pelvic Floor Muscles During Salat Movement: A Preliminary Study. 230-241. doi: 10.1007/978-3-03156438-3_23
- Fauzi, N. S. R. (2008). Rahsia Solat Dari Segi Mental dan Kecergasan Fizikal [The Secret of Prayer in Terms of Mental and Physical Fitness]. i_sihat@UiTM, Buletin Pusat Kesihatan HEP, Bil.04 (04/2008) Disember 2008, pp.08.
- Federica, A., Broilo. (2019). Twentieth-Century Mosque Architecture in East Asia: The Case of Taipei's Grand Mosque (Senibina Masjid abad ke-20 di Asia Timur: Kes Masjid Besar Taipei). 16(1):92-106. doi: 10.31436/JIA.V16I1.774
- Francis, D., Cogliano. (2023). Effect of Muslim Prayer (Salat) positions on the intra-ocular pressure in healthy young individuals. *Indian journal of ophthalmology*, 71(6):2495-2499. doi: 10.4103/ijo.ijo_2565_22
- Indah, Permata, Putri., Dwi, Nurviyandari. (2018). Exercise Therapy Joint Mobility (Muslim Prayer Movement/Salat) as a Nursing Intervention for Impaired Physical Mobility in Elderly. 3:38-. doi: 10.7454/UIPHM.V3I1.189
- Izdihar, Farah, Hanun., Johannes, Parlindungan, Siregar., Christia, Meidiana. (2023). The exploration of the dimensions and criteria for an inclusive mosque. *Journal of Islamic Architecture*, 7(4):574-583. doi: 10.18860/jia.v7i4.22932
- Kevin, Drews. (2022). <https://habibiaislamicus.com/index.php/hirj/article/view/252>. 6(2):61-68. doi: 10.47720/hi.2022.0602e04
- Komang, Agung, Irianto., Naufal, Ranadi, Firas., Carlos, Gracia, Supriantono, Binti., Damayanti, Tinduh., Yudha, Mathan, Sakti., Brigita, De, Vega. (2024). The impact of spinal fusion of adolescent idiopathic scoliosis in Salah (Islamic Prayer) movement: a retrospective case-control study. *F1000Research*, 11:1054-1054. doi: 10.12688/f1000research.124255.3
- Lestari, P., & Raodah, R. (2020). Accessibility of Persons with Disabilities in the Review of Disability Fiqh. *Santri: Journal of Pesantren and Fiqh Sosial*, 1(2), 205-218.
- Mahda Winasis, M., Hanifah Rahmi Fajrin, H., & Kartika, W. (2022). Prayer Guide Tool for the Deaf Using Gyroscope Sensor and HC-12. *ELKHA: Jurnal Teknik Elektro*, Vol. 14 No.1, April 2022, pp. 28-33.
- Mandi Sehgal, M. J., Jacobs, J., & Biggs, W. S. (2021). Mobility assistive device use in older adults. *American Family Physician*, 103(12), 737-744. <https://pubmed.ncbi.nlm.nih.gov/34128609>
- Mani, P., Vadivu, S., Alshakhs, H., Alrashed, M., Almeaibed, A., Almulhim, A., & Almulhim, N. (2021). Assessment of Accessibility Preparation for People with Special Needs at Al Ahsa Mosques. *International Journal of Health Sciences and Research*, 11(11), 102-109. <https://doi.org/10.52403/ijhsr.20211107>
- Nazar, Naamy. (2023). Observing the accessibility of disabled groups in mosque: a case study in mataram city. doi: 10.47625/fitua.v4i1.526
- Md., Mozasser, Rahman., Rayan, Abbas, Ahmed, Alharazi., Muhammad, Khairul, Imban, b, Zainal, Badri. (2023). Intelligent system for Islamic prayer (salat) posture monitoring. *IAES International Journal of Artificial Intelligence*, 12(1):220-220. doi: 10.11591/ijai.v12.i1.pp220-231
- Mohammad, Abdul, Mohit. (2014). Role of the masjid in disaster management: Preliminary investigation of evidences from Asia. 4(1)

- Mozasser, Rahman., Rayan, Abbas, Ahmed, Alharazi., Muhammad, Khairul, Imran, B, Zainal, Badri. (2021). Monitoring and Alarming Activity of Islamic Prayer (Salat) Posture Using Image Processing. doi: 10.1109/ICCCE50029.2021.9467155
- Muhammad, Najib, Abd, Wakil., Azman, Ab, Rahman., Ahmad, Syukran, Baharuddin. (2024). Pemerkasaan Institusi Masjid Sebagai Pusat Bantuan Ekonomi Lokal Di Malaysia. Jurnal pengurusan dan penyelidikan fatwa =, 29(2):115-126. doi: 10.33102/jfatwa.vol29no2.584
- Muhammad, Osama., Reem, Javed, Malik. (2019). Salat (Muslim prayer) as a therapeutic exercise. Journal of Pakistan Medical Association, 69(3):399-404.
- Muhammad, Reza, Kazimi. (2022). Sana Haroon, The Mosques of Colonial South Asia A Social and Legal History of Muslim Worship (London: I.B. Tauris, 2021), 238.. Policy perspectives (Islamabad), 19(1) doi: 10.13169/polipers.19.1.br1
- Muhamamd, Zahrul, Anama., Miftahulhaq, Miftahulhaq., Sidik, Jatmika., Muhammad, Indrawan, Jatmika. (2023). Capacity Building Workshop to Improve Mosque Accessibility For Disabled Muslims in Muhmmadiyah of Bantul, Yogyakarta. Deleted Journal, 1(2) doi: 10.18196/iccs.v1i2.130
- N., Aldossary., Manal, Murshed, Alharbi., Nada, Hussein, Aldahlawi., Amal, Aldarwesh. (2023). Effect of Muslim Prayer (Salat) positions on the intra-ocular pressure in healthy young individuals. Indian Journal of Ophthalmology, 71:2495-2499. doi: 10.4103/IJO.IJO_2565_22
- Nani, Cahya, Ningrum., Nurhayatu, Nufut, Alimin., Prima, Adhi, Kusuma., Lu'lu', Purwaningrum. (2020). The effect of adding armrest and seat assist on chair for elderly prayer performance (sitting to standing). 2217(1):030184-. doi: 10.1063/5.0003455
- Nasrudin, M. (2021). Correlation of Human Movement System Material in Salat Movement: Study of Integration of Science and Religion. INSECTA Integrative Science Education and Teaching Activity Journal, 3(1), 20-29.
- Nik, Fatma, Arisya, Nik, Yahya., Kamran, Shavarebi., Muhammad, Izzat, Nor, Ma'arof., Mazura, Mahdzir., Muhammad, Luqman, Abdul, Samad., Mohamad, Fariz, Mohamed, Nasir., Nurulhuda, Ahamad. (2024). A Review of People with Disability's (PWD) User Experience in Malaysian Mosques. Springer series in design and innovation, 287 301. doi: 10.1007/978-3-031-60863-6_24
- Pelvic floor. (2021). Retrieved from <https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/pelvic-floor#bhc-content>.
- Pita, M. N., Sari, C. P., & Muliono, A. C. (2012). Literature Study: The Difference In Risk Of Falls Before And After Chair-Based Exercise On Elderly. Jurnal Wira Mandala, <http://journal.wima.ac.id/index.php/JWMJ/article/view/3502>
- Putri, T. N., Abrar, R., & Fatrias, D. (2022). Evaluation and Design Public Facilities for People with Disabilities in Al Hakim Mosque, Indonesia. Andalasian International Journal of Applied Science, Engineering and Technology, 2(2), 72-82. DOI: <https://doi.org/10.25077/aijaset.v2i2.37>
- Rifky, Ismail., Eko, Saputra., Mohammad, Tauviquirrahman., A.B., Legowo., Iwan, Budiwan, Anwar., Jamari, Jamari. (2014). Numerical Study of Salat Movements for Total Hip Replacement Patient. Applied Mechanics and Materials, 493:426-431. doi: 10.4028/WWW.SCIENTIFIC.NET/AMM.493.426
- Sobri, M. I. M., Ismail, S., Sumarni, Sabil, A., Yusof, H., Asif, N., Setiyowati, E., & Mat, S. (2021). Systematic review of sustainable design approach for mosque. Journal of Islamic Architecture, 6(4), 369-375.
- Siti, Khadijah, Jannati. (2021). Efficacy of Prayer Movement on the Back Flexibility in Students. Deleted Journal, 7(1):140-145. doi: 10.37275/arkus.v7i1.91
- Siti, Salwana, Mohd, Nawayai., Zuraini, Denan., Noor, Hanita, Abdul, Majid. (2020). Readaptation of malay vernacular architecture for indoor thermal comfort in modern masjids towards a sustainable design. PLANNING MALAYSIA JOURNAL, 18(12) doi: 10.21837/PM.V18I12.751
- Udin, U., Fitriah, F., Sugianto, L. O., Khairunnisa, R., La Ula, H., Ihsaniati, N. S. N., & Wijayanto, W. (2023). Mosque based youth leadership cadre. Multidisciplinary Science Journal, 6(2), 2024010. <https://doi.org/10.31893/multiscience.2024010>
- Zawawi, B. S., Hazim, Z., Haron, S. S., & Ayob, S. (2022). Sustainable prayer chair design characteristic for people with disabilities. Journal of Islamic Architecture, 7(2), 306.
- Zawin, Hannan, Sofea, Shahbuddin., Setiawan, Gunardi. (2023). Tinjauan Literatur Sistematis Terhadap Peranan Institusi Masjid di Malaysia. al-'Abqari, 54-71. doi: 10.33102/abqari.vol29no1.508 (2023). Penerapan google sites sebagai sarana pemasaran digital masjid an-nur. Rural Development For Economic Resilience (RUDENCE), 2(3) doi: 10.53698/rudence.v2i3.56